

CLAIMS:

Claim 1. (previously amended) A method for separating at least two particles, the particles having different dielectric constants, the method comprising the steps of:

applying a light source to create a light intensity pattern:

exposing the at least two particles to the light intensity pattern producing force on each particle;

moving the light intensity pattern with respect to the at least two particles causing the at least two particles to move with the light intensity pattern at velocities related to their respective dielectric constants, wherein each of the at least two particles moves at a different velocity causing the at least two particles to separate.

Claim 2. (original) The method according to claim 1, wherein the step of applying a light source further comprises interfering at least two optical light beams.

Claim 3. (original) The method according to claim 2 wherein the at least two optical light beams are coherent light beams.

Claim 4. (original) The method according to claim 2 wherein the at least two optical light beams are incoherent light beams.

Claim 5. (original) The method according to claim 2 further comprising splitting one optical light beam to create the at least two optical light beams.

Claim 6. (original) The method according to claim 1 wherein the step of applying a light source further comprises using an optical mask to create the light intensity pattern.

Claim 7. (original) The method according to claim 6 wherein the optical mask comprises an amplitude mask.

Claim 8. (original) The method according to claim 6 wherein the optical mask comprises a phase mask.

Claim 9. (original) The method according to claim 6 wherein the optical mask comprises a holographic mask.

Claim 10. (original) The method according to claim 1 wherein the step of applying a light source further comprises periodically dimming and brightening a plurality of light sources to create the light intensity pattern.

Claim 11. (original) The method according to claim 1 wherein the light intensity pattern comprises at least two peaks.

Claim 12. (original) The method according to claim 1 wherein the light intensity pattern comprises at least two valleys.

Claim 13. (original) The method according to claim 1 wherein the light intensity pattern is sinusoidal.

Claim 14. (original) The method according to claim 1 wherein the light intensity pattern is periodic but not sinusoidal.

Claim 15. (original) The method according to claim 1 wherein the light intensity pattern is constant in time.

Claim 16. (original) The method according to claim 1 wherein the light intensity pattern varies in time.

Claim 17. (original) The method according to claim 1 wherein the light intensity pattern is periodic and the period is optimized to create separation between the at least two particles.

Claims 18-19. (cancelled)

Claim 20. (original) The method according to claim 1 wherein the light intensity pattern is generated with coherent optical beams and the step of moving the light intensity pattern further comprises modulating the phase of the light beam(s).

Claim 21. (original) The method according to claim 1 wherein the light intensity pattern is moved at a constant velocity.

Claim 22. (previously amended) The method according to claim 1 further comprising optimizing velocity of the light intensity pattern to cause separation based on the dielectric constants of the at least two particles.

Claim 23. (original) The method according to claim 1 further comprises after allowing the at least two particles to separate, altering velocity of the light intensity pattern with respect to the at least two particles causing further separation of the at least two particles.

Claim 24. (original) The method according to claim 1 wherein the light source has a wavelength of between $0.3\mu\text{m}$ and $1.8\mu\text{m}$.

Claim 25. (original) The method according to claim 24 wherein the wavelength is between $0.8\mu\text{m}$ and $1.8\mu\text{m}$.

Claim 26. (original) The method according to claim 25 wherein the wavelength is exactly or approximately $1.55\mu\text{m}$.

Claim 27. (original) The method according to claim 1 wherein at least one of the at least two particles have a resonant frequency and the light intensity pattern has a wavelength tuned to the resonate frequency of one of the at least two particles.

Claim 28. (original) The method according to claim 1 wherein the light intensity pattern is two-dimensional.

Claim 29. (original) The method according to claim 28 wherein the light intensity pattern has a period in each of the two dimensions and the period is different in each dimension.

Claim 30. (original) The method according to claim 1 wherein the light intensity pattern is three-dimensional.

Claim 31. (original) The method according to claim 30 wherein the light intensity pattern has a period in each of the three dimensions and the period is different in at least two of the dimensions.

Claim 32. (original) The method according to claim 1 wherein the at least two particles are carried in a medium.

Claim 33. (original) The method according to claim 32 wherein the medium is a fluidic medium.

Claim 34. (original) The method according to claim 33 wherein the medium is non-guided.

Claim 35. (original) The method according to claim 33 wherein the medium is guided.

Claim 36. (previously amended) The method according to claim 35 wherein the guided medium includes fluidic channels.

Claim 37. (original) The method according to claim 1 further comprising the step of superimposing a gradient onto the light intensity pattern.

Claim 38. (original) The method according to claim 37 wherein the gradient is spatially constant.

Claim 39. (original) The method according to claim 37 wherein the gradient is spatially varying.

Claim 40. (original) The method according to claim 37 wherein the gradient is temperature.

Claim 41. (original) The method according to claim 37 wherein the gradient is pH.

Claim 42. (original) The method according to claim 37 wherein the gradient is viscosity.

Claim 43. (original) The method according to claim 1 further comprising the step of superimposing an external force onto the light intensity pattern.

Claim 44. (original) The method according to claim 43 wherein the force is constant.

Claim 45. (original) The method according to claim 43 wherein the force is varying spatially and/or temporally.

Claim 46. (original) The method according to claim 43 wherein the force is magnetic.

Claim 47. (original) The method according to claim 43 wherein the force is electrical.

Claim 48. (original) The method according to claim 43 wherein the force is gravitational.

Claim 49. (original) The method according to claim 43 wherein the force is fluidic.

Claim 50. (original) The method according to claim 43 wherein the force is frictional.

Claim 51. (original) The method according to claim 46 wherein the force is
electromagnetic.

Claim 52. (original) The method according to claim 1 further comprising the step of
monitoring separation of the at least two particles.

Claim 53. (original) The method according to claim 52 further comprising providing
feedback regarding particle separation.

Claims 54-78 (cancelled)

Claim 79. (previously added)The method according to claim 1 wherein the particles are
cells.

Claim 80. (previously added)The method of sorting particles in a branched microfluidic
device comprising the steps of:

providing a device having a main channel, a first branch channel, and a second branch
channel;

flowing a plurality of particles down the main channel;

superimposing a moving light intensity pattern on the device at a junction between the main channel, the first branch channel, and the second branch channel causing at least some of the plurality of particles to be directed into the first branch channel and at least some of the plurality of particles to be directed into the second branch channel, wherein the sorting of the particles into the first branch channel and the second branch channel is based at least in part on the dielectric constants of the particles.

Claim 81. (previously added)The method of claim 80 wherein the particles are cells.

Claim 82. (previously added)The method of claim 80 wherein the main channel, the first branch channel, and the second branch channel intersect to form a T.

Claim 83. (previously added)The method of claim of claim 80 wherein particles having a dielectric constant below a threshold level are directed into the first branch channel and particles having a dielectric constant above a threshold level are directed to a second branch channel.

Claim 84. (previously added)The method of claim 80 comprising the additional step of further sorting the particles in one or both of the first branch channel and the second branch channel.

Claim 85. (previously added)The method of claim 80 further comprising the step of monitoring the separation of the particles into the first branch channel and the second branch channel.